

# SARCASM UNDERSTANDING ACROSS THE LIFESPAN

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## ABSTRACT

KRISTEN BLAIR BARNETT: Sarcasm Understanding Across the Lifespan (Under the direction of Stephanie Miller)

Research has identified a developmental progression of sarcasm understanding, stating that children get better at understanding sarcasm as they get older, though adults are still not perfect at reliably detecting sarcasm. This may be related to the cues present (e.g., story context, verbal cues, and facial expressions). Research has primarily focused on verbal cues, specifically exaggerated or “dripping” intonation, in child and adult populations. The literature is lacking in the realm of facial expressions and child populations. This study aimed to add to the literature concerning facial expressions as well as to evaluate sarcasm understanding with more than one cue present. To study this, participants were presented with stories in which a negative event occurred then they were asked questions to assess their understanding of the speaker’s mind. I found that children focused mainly on facial expressions while adults focused mainly on prosody (i.e., intonation). This is an interesting find because it suggests that sarcasm detection changes over the lifespan in regards to the types of cues used. It also suggests that children may only need facial expressions whereas adults may find prosody to be a reliable predictor of sarcasm.

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## Introduction

Irony is commonly referred to as a form of non-literal language, that goes beyond the meaning of the words in their literal sense. Although many studies use sarcasm and irony almost interchangeably, there is a difference in the two elements of language when it comes to definition and perception (Glenwright & Pexman, 2010). Sarcasm is typically meant to criticize or make fun of another person, and it typically uses a bitter delivery in order to indirectly express a negative attitude (Burnett, 2015). Irony, on the other hand, may be used to criticize, but it also other elements of communications such as humor and understatements (Burnett, 2015). Typically, irony is also not directed at a specific target (Glenwright & Pexman, 2010). Therefore, sarcasm can be seen as a subset of irony. For example, consider these two situations:

(1) Michelle, Allie, and Miles are sitting in class, and Allie accidentally knocks over her drink, spilling it everywhere. She groans and says “Wow! That’s just *great*.”

(2) Michelle, Allie, and Miles are sitting in class, and Miles accidentally knocks over Allie’s drink, spilling it everywhere. Allie groans and tells Miles “Wow! That’s just *great*.”

The first example would be an example of ironic criticism because Allie is making a general, verbal statement about the situation. In the second example, Allie says a sarcastic comment directed specifically towards Miles, with the intent to criticize his action of knocking over her drink. The distinction between irony and sarcasm may be hard to detect, often made more difficult by shifting perceptions of the words “irony” and “sarcasm” (Attardo et al., 2003). However, some researchers suggest that the distinction lies in others’ sensitivity to the comment (Glenwright & Pexman, 2010), thus sarcasm



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incorporates an element of social cognition and social understanding (e.g., to be sarcastic one must understand beliefs, intentions, and attitudes of another individual). It is important to better understand how individuals across the lifespan interpret sarcasm because sarcasm has a social function. For example, there is a social cost to pay for not understanding sarcasm (e.g., not realizing someone is teasing you) because sarcasm is widely used in everyday conversations (Gibbs 2000). Additionally, fully understanding sarcasm can tell us something about social cognitive abilities and how sarcasm may be impacted by individual differences in cognition. The purpose of the present study is to focus specifically on sarcasm in the context of social cognition, with an emphasis on whether facial expressions and prosody (e.g., melody of speech) affect the interpretation of sarcasm understanding across the lifespan.

### **Studying Sarcasm Across the Lifespan**

Sarcasm is particularly important developmentally because of its link to social understanding—an ability that shows great development during preschool and middle childhood (Carlson, Mandell & Williams, 2004; Glenwright & Pexman, 2010; Miller, 2009). In children, sarcasm is typically studied by presenting or reading stories that contain sarcastic remarks then asking questions about speaker meaning, belief, intention, and motivation (Burnett, 2015; Capelli, Nakagawa & Madden, 1990; Filippova & Astington, 2008; Glenwright, Parackel, Cheung & Nilsen, 2014; Glenwright & Pexman, 2010). There are various forms in which the stories may be delivered, with the most typical being stories followed up by direct questioning. Researchers might present the sample from above: “Michelle, Allie, and Miles are sitting in class, and Miles accidentally knocks over Allie’s drink, spilling it everywhere. Allie groans and tells

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Miles “Wow! That’s just *great*.” To assess sarcasm understanding, participants would be asked questions on the story content (e.g., “Was Allie serious or joking?” and “Why did she make that comment?”). There are different ways to analyze participant responses. For example, some researchers have looked at speaker attitudes by having participants rate how nice or mean or how funny or serious the person was being (Glenwright et al., 2014; Glenwright & Pexman, 2010). Others have used a more fine-grained analysis to examine particular components of sarcasm understanding. For example, Filippova & Astington (2008) asked children a series of questions related to understanding of various social concepts like meaning (e.g., Does Allie mean that?”), belief (e.g., “Does Allie think Miles spilling the drink was great?”), intention (e.g., “Does Allie want Miles to believe that she thinks Miles spilling the drink was great?”), and attitude/motivation (e.g., “Did Allie say Miles’ action of spilling the drink was great to tease him?”).

There is currently a debate as to what age children understand sarcasm. In Fillipova and Astington’s (2008) study with 5- to 9-years-olds, children better understood sarcasm as they got older. Based on their results, Filippova and Astington (2008) proposed a developmental progression in children’s understanding of sarcasm linked to increasing levels of social understanding. They found that children first must be able to represent speaker belief (e.g., Allie did not believe it was great that Miles spilled the drink) before they can understand the speaker’s intention (e.g., Allie did not want Miles to believe she thought spilling the drink was great); after understanding the intention, children are then able to understand the speaker’s motivation/attitude (e.g., Allie was teasing Miles) (Filippova & Astington, 2008). Simply, this means that for understanding sarcasm, children must master the previous skills before they can move forward.

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Studies have also tried to determine the specific ages at which children master the skills essential to reliably detecting sarcasm. Researchers have found that children around 6 years of age are able to understand that sarcastic speakers are speaking non-literally. However, they do not completely understand the speaker's intention or motivation for doing so (Filippova & Astington, 2008; Glenwright & Pexman, 2010). Children at the age of 9 are more accurate at understanding intentions, but even these older children are not as accurate as adults (Filippova & Astington, 2008; Glenwright & Pexman, 2010). Based on this work, there is clear development in the detection and understanding of sarcasm between 6- and 9-year-old children, however, it is also clear that they still do not completely understand sarcasm by the age of 9, meaning that children are still developing essential social and cognitive skills that allow them to understand sarcasm in middle childhood.

### **Cues that are Used to Detect Sarcasm**

Some researchers have also studied sarcasm by looking at what cues people use to detect it, typically by manipulating the context of the story (Capelli et al., 1990) or by manipulating auditory cues (such as prosody) in the stories (Capelli et al., 1990; Glenwright et al., 2014). Several cues exist for detecting sarcasm, which adults and children use to different extents. Adults are typically capable of using all known linguistic (verbal) and non-linguistic (nonverbal) communication cues to detect sarcasm. Linguistically, prosody (i.e., a term that describes differences in pitch, volume, tempo, and rhythm, Crystal 2008) is arguably the most important verbal cue. Studies have clearly linked sarcasm with intonation, though researchers do not seem to agree on the exact pattern. Some studies have found that exaggerated pitch is indicative of sarcasm (Adachi,

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1996), whereas others have found that a lower (Anolli et al., 2000) or higher pitch is a cue for sarcasm (Rockwell, 2000). Because of this inconclusiveness, the use of pitch different than the rest of the sentence may be the best way to characterize the use of prosody in sarcasm. For example, recent studies have manipulated the intonation and more general prosody changes they term dripping (i.e., very exaggerated) or dry intonation (i.e., not much different in sound from the rest of the sentence, Glenwright et al., 2014). In the adult literature, sarcasm comprehension is greater when dripping intonation is presented compared to the more subtle dry intonation (Glenwright et al., 2014).

Another important cue used by adults to interpret sarcasm is context, which refers to the content of the story or situation where the sarcastic comment is uttered. The bigger the discrepancy between the facts of a situation and the sarcastic remark, the more likely it is for the listener to understand the speaker is being sarcastic (Capelli et al., 1990). For example, a story might say something like this: “Anna decided she wanted to take a bike ride with her friend Johnny, so she invited him. Anna and Johnny went outside and saw that it was raining. Johnny really hates rainy weather. Johnny says ‘Wow you picked a great day for a bike ride. This is the *best* weather.’” Most readers would be able to recognize that Johnny does not think the rainy weather is the best because the context of the story stated that Johnny really hates rainy weather. Therefore, readers should be able to conclude that Johnny is being sarcastic towards Anna without any additional cues.

Lastly, facial expressions are another important cue in detecting and understanding sarcasm, though it is less researched. Ekman and Friesen (1977) proposed a neurocultural theory of facial expressions of emotion, which essentially stated that the

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facial expressions used to express certain emotions (i.e., happiness, sadness, anger) are universal (Ekman, Davidson, & Friesen, 1990; Ekman & Friesen, 1977). So, generally speaking, we know that people pay attention to facial expressions when trying to understand another person. Therefore, it would make sense if people also used facial expressions to decode sarcasm. Several researchers have found the mouth (e.g., smiling) and the eyes/eyebrows (e.g., up eyebrows, eye-rolling, winking, squinting, and so on) as indicators of sarcasm (Attardo et al., 2003). Blank face, or having no expression, can also be indicative of sarcasm (Attardo et al., 2003) because typically the listener would expect some sort of reaction; the lack of facial emotion, therefore, allows some listeners to interrupt a speaker's statement as sarcastic. Thus, it is clear that facial expressions are a cue in detecting sarcasm. Although some researchers have emphasized the mouth region as the most significant in detecting sarcasm (Rockwell, 2001), this has not yet been widely examined and further research is needed to understand the extent to which facial expressions are important to the detection of sarcasm, especially within a developmental context.

Developmentally, we know that adults can use all these different cues (Ekman & Friesen, 1977), although they may not need multiple cues to identify sarcastic statements. Some researchers suggest that adults only need one cue to recognize sarcasm (Capelli et al., 1990). This makes sense because adults are able to understand sarcasm when it is written; they do not possess auditory stimuli of the sarcastic dialogue. This is not to say that adults cannot use more than one cue at a time, as sarcasm detection may be stronger when multiple cues are presented.

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Children, on the other hand, do not use sarcasm detection cues the same way as adults. In the past, it was thought that children younger than 10 did not rely on intonation when it came to detecting sarcasm (Winner, 1988; Winner et al., 1987). New research suggests intonation is a sufficient cue for children to detect sarcasm (Capelli et al., 1990). Children of all ages, even infants, are capable of recognizing and paying attention to variations in intonation (Capelli et al., 1990). For example, the use of prosody in detecting sarcasm seems to be present in children younger than 5 or 6 (Capelli et al., 1990; Filippova & Astington, 2008; Glenwright et al. (2014); Glenwright & Pexman, 2010). A dripping intonation seems to be especially notable. Adults and children between the ages of 5 and 6 were better able to understand the non-literal aspect of sarcastic remarks when the intonation was dripping (Glenwright et al., 2014). However, 5- and 6-year-olds are not perfect at detecting sarcasm. For the Glenwright study, many of the children rated the sarcastic remarks as serious whereas the adults were able to recognize the humor behind the sarcastic remark when presented with dripping prosody compared to a literal criticism (Glenwright et al., 2014). However, although there is evidence that children can use auditory cues to a limited extent in their detection of sarcasm, there appears to be no research focusing on the link between facial expressions and sarcasm understanding with child participants.

### **The Present Study**

The present study aims to further research in sarcasm understanding across the lifespan. I specifically focused on 6- to 9-year-olds given that current literature on this topic has identified that children are progressively becoming better at understanding sarcasm during this age range. I also expanded the study to adults because, although children are improving in sarcasm understanding, they are not perfect, and adults also show individual differences in their interpretation of sarcastic statements. I looked at cues that may increase sarcasm understanding in order to get a more comprehensive view of sarcasm understanding in this age range. Most notably, I incorporated facial cues which have not been examined across the lifespan. Thus, my research question focused on whether manipulating prosody and facial cues will affect sarcasm understanding and if the usage of cues are different between child and adult participants.

In order to study this question, I based my methods mainly on the research of Filippova and Astington (2008), Glenwright et al., 2014, and Glenwright and Pexman (2010). I used sarcasm stories in order to present sarcastic remarks and literal criticisms while also varying the cues within the story (context, prosody, and facial expressions). I expected to see that children got better at reliably detecting sarcasm as they got older and that both children and adults relied on the dripping intonation the most. However, I also hoped to add to the literature concerning the importance of facial cues in both child and adult participants. Lastly, I compared and contrasted the adults' performance versus the children's performance on the sarcasm task.

## Methods

### Participants

The participants for this study consisted of 40 University of Mississippi undergraduates (26 female, 14 male) between the ages of 18 and 22 and 13 children between the ages of 6 and 9 (8 female, 5 male). The undergraduates received partial course credit for their participation, and the children received small prizes (i.e. a bouncy ball, stickers, etc.) for their participation. Additionally, children who came into our lab on campus received a t-shirt for their participation.

### Procedure

The undergraduate and child participants were asked to participate in a study that lasted approximately 1 hour and 15 minutes. It consisted of nine components in a fixed order: (1) sarcasm stories (2) an executive function sorting task (3) sarcasm stories (4) adapted Florida Affect Battery task (5) an executive function backwards digit span (6) faux pas stories (7) Mind in the Eyes task (8) WASI (9) and a philosophy understanding story task. The sarcasm story task was the only task within the scope of the present research. All components were completed by both undergraduate and child participants with some tasks incorporating slight modifications to make tasks more appropriate for adults.

### Sarcasm Measures

**Sarcasm Stories.** This task required the use of stories to measure participants' abilities to detect and understand sarcasm (Fillipova & Astington, 2008; Glenwright & Pexman, 2010). Eighteen stories were presented on a personal computer with pre-recorded clips and illustrations. Figure 1 shows an example of pictures from the stories.



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After each story was completed, the experimenter asked the participants a series of questions. There were seven questions designed to examine if the participant understood the story and whether or not the speaker was being sarcastic (Fillipova & Astington, 2018; Glenwright & Pexman, 2010).

Participants completed a within subjects repeated measure design. There were 4 independent variables: story context (positive or negative), closing statement (compliment or criticism), prosody (dripping or dry), and facial expressions (smile or grimace, see Figure 2). This resulted in eighteen distinct stories with a variety of cues (see Table 1). For example, a story with a negative context, compliment, dripping intonation, and a grimace facial expression might say (also see Figure 1 & 2): “This is Julie and Sarah. Julie made Sarah a birthday cake and thought it would be nice to put mushrooms on the cake, but the cake tasted bad. Sarah said ‘Wow this is a yummy cake [in a dripping intonation with a grimace].’” It is important to note here that only stories in which a negative event occurred (16 out of 18 stories) were examined to ensure that participants understood nonliteral (i.e., compliment) statements as more sarcastic than literal (i.e., critical) statements as sarcasm is a form of non-literal speech.

Sarcasm understanding was calculated based on the response to the first five questions. These five questions focused on children’s understanding of story comprehension (e.g., “Did Sarah make a yummy cake?”), speaker meaning (e.g., “Does she mean this?”), speaker belief (e.g., “Does Julie think Sarah made a yummy cake?”), speaker intention (e.g., “Does Julie want Sarah to believe that she thinks Sarah made a yummy cake?”), and speaker attitude (e.g., “Did Julie say Sarah made a yummy cake to tease her?”). Participants were asked to answer either “yes” or “no” to these questions,

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and I used their answers to create an overall sarcasm score. For each question, the answer was assigned a 1 for the interpretation more in line with a sarcastic interpretation. More specifically, participants were assigned a 1 if they answered “no” to comprehension, meaning, belief, and intention questions and if they answered “yes” to the attitude question. This is because if the person perceived the story as sarcastic, the answers would be NO Sarah did not make a yummy cake, NO she did not mean her statement, NO she did not think Sarah made a yummy cake, and NO she does not want Sarah to believe that she thinks Sarah made a yummy cake. For the attitude question, sarcasm is considered teasing, so a “yes” response was given a score of 1. All other responses were given a 0. Thus, across all five questions, children received a score ranging from 0-5 with higher scores referring to a more sarcastic interpretation of the statements.

I also included two questions to further assess speaker attitude when making these statements, assuming that if the statement was considered sarcastic, they may rate the statement more mean and more funny (adults) or serious (children, Glenwright et al., 2014). These questions were: “Show me how nice or mean Julie was trying to be when she said Sarah made a yummy cake” and “Show me how funny or serious Julie was trying to be when she said Sarah made a yummy cake.” In order to answer these questions, participants were shown a scale with different facial expressions (see Figure 3) in which they could answer from 1-6 if Julie was being nice or mean (1 being nice, 6 being mean) and if Julie was being funny or serious (1 being funny, 6 being serious). Based on these scales, higher scores meant the participant found the situation as more mean and more serious respectively. These were considered as two separate measures of speaker attitude.

## Results

Child participants were analyzed separately from adult participants. For each age group, I ran three separate repeated measures general linear models (GLMs) on three dependent variables: overall sarcasm score, nice/mean ratings, and funny/serious ratings. For all GLMs, the same design was conducted including three independent variables with two levels each: closing statement (compliment or criticism), prosody (dry or dripping), and facial expressions (smile or grimace). For all analyses, I examined all main effects and all possible interactions.

### Child Participants

**Overall Sarcasm Score.** I found that closing statement had a significant effect, Wald  $\chi^2(1)=56.32, p<0.001$ . Compliments were rated as more sarcastic,  $M=3.42, s=0.27$ , than criticisms,  $M=1.17, s=0.11$ . I also found a statement by face interaction, Wald  $\chi^2(1)=14.35, p<0.001$ , see Figure 4. I further tested this interaction and found no effect of face for compliment statements, Wald  $\chi^2(1)=1.56, p=0.21$ , but I did find an effect of face when the statement was a criticism, Wald  $\chi^2(1)=7.45, p=0.006$ . When the statement was a criticism, smiling facial expressions led to more sarcastic ratings,  $M=1.50, s=0.20$ , than grimacing facial expressions,  $M=0.85, s=0.11$ .

**Nice/Mean Ratings.** I found that closing statement, Wald  $\chi^2(1)=15.29, p<0.001$ , and facial expressions were significant, Wald  $\chi^2(1)=5.79, p=0.016$ . Criticizing statements,  $M=4.25, s=0.21$ , were rated as more mean than compliment statements,  $M=3.63, s=0.22$ . Grimacing faces,  $M=4.14, s=0.22$ , were rated as more mean than smiling faces,  $M=3.74, s=0.21$ . Additionally, I found a prosody by statement interaction, Wald  $\chi^2(1)=4.08, p=0.04$ , see Figure 5. Statements had a significant effect when the prosody was dry, Wald

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$\chi^2(1)=12.70, p<0.001$ , but not when the prosody was dripping, Wald  $\chi^2(1)=1.66, p=0.20$ .

When prosody was dry, those with critical statements rated it as more mean,  $M=4.46, s=0.24$ , than those with compliment statements,  $M=3.47, s=0.26$ .

**Funny/Serious Ratings.** I found that closing statement had a significant effect, Wald  $\chi^2(1)=16.13, p<0.001$ . Criticism statements were rated as more serious,  $M=4.40, s=0.29$ , than compliment statements,  $M=3.50, s=0.08$ .

### Adult Participants

**Overall Sarcasm Score.** I found that closing statement, Wald  $\chi^2(1)=1241.8, p<0.001$ , and prosody, Wald  $\chi^2(1)=38.15, p<0.001$ , had a significant effect on the sarcasm score. Compliment statements led to higher sarcasm scores,  $M=3.83, s=0.066$ , than criticism statements,  $M=0.63, s=0.068$ . Dripping prosody led to higher sarcasm scores,  $M=2.46, s=0.068$ , than dry prosody,  $M=2.00, s=0.054$ . I also found a significant interaction between closing statement and prosody, Wald  $\chi^2(1)=6.21, p=0.013$ , see Figure 6. Prosody was significant for both criticism and compliment statements. When statements were compliments, those with a dripping prosody had a higher sarcasm score, mean difference=0.65, Wald  $\chi^2(1)=45.56, p<0.001$ , whereas when statements were criticisms, the difference due to prosody was smaller, mean difference=0.26, Wald  $\chi^2(1)=5.01, p=0.025$ .

**Nice/Mean Ratings.** For nice/mean ratings, I found that closing statement, Wald  $\chi^2(1)=60.73, p<0.001$ , prosody, Wald  $\chi^2(1)=33.99, p<0.001$ , and facial expressions, Wald  $\chi^2(1)=20.55, p<0.001$ , were significant. Criticism statements led to more mean ratings,  $M=3.86, s=0.093$ , than compliment statements,  $M=2.99, s=0.091$ . Dripping prosody led to more mean ratings,  $M=3.68, s=0.092$ , than dry prosody,  $M=3.17, s=0.79$ .

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Grimacing facial expressions led to more mean ratings,  $M=3.69$ ,  $s=0.093$ , than smiling facial expressions,  $M=3.16$ ,  $s=0.095$ . I also found a significant interaction between closing statement and prosody, Wald  $\chi^2(1)=27.80$ ,  $p<0.001$ , see Figure 7. I ran an additional test to look at the interaction and found that prosody only matters for compliment statements, Wald  $\chi^2(1)=55.86$ ,  $p<0.001$ . Specifically, when statements were compliments, participants rated statements with dripping prosody as more mean,  $M=3.42$ ,  $s=0.11$ , than statements with dry prosody,  $M=2.56$ ,  $s=0.10$ . Prosody did not matter for criticism statements, Wald  $\chi^2(1)=2.46$ ,  $p=0.12$ .

**Funny/Serious Ratings.** For funny/serious ratings, I found that closing statement, Wald  $\chi^2(1)=28.01$ ,  $p<0.001$ , and facial expressions, Wald  $\chi^2(1)=42.08$ ,  $p<0.001$ , were significant. Criticism statements led to more serious ratings,  $M=4.16$ ,  $s=0.14$ , than compliment statements,  $M=3.49$ ,  $s=0.092$ . Grimacing facial expressions led to more serious ratings,  $M=4.29$ ,  $s=0.11$ , than smiling facial expressions,  $M=3.35$ ,  $s=0.13$ . Additionally, I found a prosody by closing statement interaction, Wald  $\chi^2(1)=4.16$ ,  $p=0.041$ , see Figure 8, and a closing statement by facial expression interaction, Wald  $\chi^2(1)=5.36$ ,  $p=0.021$ , see Figure 9. For the prosody by closing statement interaction, it appeared that statements were significant for both dry and dripping prosody. When prosody was dry, criticism statements were rated as more serious, mean difference=0.59, Wald  $\chi^2(1)=9.69$ ,  $p=0.002$ . When prosody was dripping, criticism statements were rated as more serious, mean difference=0.87, Wald  $\chi^2(1)=29.46$ ,  $p<0.001$ . Thus, the difference due to statements was likely greater when prosody was dripping. For the statement by facial expression interaction, facial expression was significant for both compliment and criticism statements. When statements were criticisms, those with grimacing facial

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expressions rated the situation as more serious, mean difference=1.22, Wald  $\chi^2(1)=13.33$ ,  $p<0.001$ . When statements were compliments, those with grimacing facial expressions rated the situation as more serious, mean difference=0.65, Wald  $\chi^2(1)=14.26$ ,  $p<0.001$ . The difference due to facial expressions was likely greater when the statement was a criticism.

### **Discussion**

The purpose of this study was to examine both children and adults on how sarcastic they rate statements when provided with different cues such as prosody (e.g., dry vs. dripping) and facial expressions (e.g., smiling vs. grimacing). Overall, it appears that cue usage may shift across the lifespan with children primarily using facial expressions and adults primarily using prosody when detecting sarcasm.

#### **Children's Use of Cues in Sarcasm Understanding**

When facial cues and prosody are presented to children in a sarcasm understanding task, prosody does not seem to be an informative cue in children's sarcasm judgments. The only rating it influenced was the nice mean judgments, demonstrating that when prosody was dry, criticism statements were rated as more mean. This is a surprising find because most of the literature focused on prosody as a cue for children detecting sarcasm. Past research has generally agreed that prosody is a sufficient cue for detecting sarcasm and appears to be present in children as young as 5 and 6 (Capelli et al., 1990; Filippova & Astington, 2008; Glenwright et al., 2014; Glenwright & Pexman, 2010). However, it may be that when facial cues are also present, facial cues may be more helpful or salient to children when making sarcasm judgments than prosody. Even though it is known that children recognize prosody (Capelli et al., 1990), attuning to facial expressions may precede using intonation for sarcasm judgments.

Specifically related to facial cues, I found that for overall sarcasm score, smiling facial expressions led to higher sarcasm scores when the statement was a criticism. This is interesting because it appears that children are interpreting a positive face (i.e., a smile) paired with a criticism (e.g., "That cake is not yummy") as more sarcastic. Typically,

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compliments (e.g., “That cake is yummy”) about negative events (e.g. a gross tasting cake) would be what is traditionally thought of as sarcasm, but it appears that children are able to appreciate the disparity between a person giving a critical statement while smiling. This is known as a mismatch of information or cues. We know that the mismatch between verbal and non-verbal cues (e.g., a negative story context paired with dry intonation or smiling face) is indicative of sarcasm and leads to higher sarcasm scores in adults (Jacob et al., 2016), but less is known about mismatch of cues in children when considering facial expressions. To my knowledge, the importance of facial expressions has not been widely studied in children with reference to sarcasm. Though, we do know, developmentally, that children’s understanding and recognition of emotion (via facial expressions) precedes the ability to understand another person’s mental state (Agostino, et al., 2017; Montague & Walker-Andrews, 2001).

Additionally, facial cues impacted nice/mean ratings. Grimacing faces were rated as more mean than smiling faces, which makes sense considering a grimace is more mean-looking than a smile. It may be that when children saw the nice/mean scale (see Figure 3), that they paired the critical statement (e.g., “That cake is not yummy”) with the mean frowning face on the scale. This aligns with research that suggests facial cues are an important component in interpreting different forms of social communication (Agostino, et al., 2017). When considering the role of facial expressions in both overall sarcasm score and nice/mean ratings, it may be that for the age range tested, 6-9-year-olds, that facial expressions are more predictive of sarcasm than prosody.



### **Adults's use of Cues in Sarcasm Understanding**

Compared to children, who marginally attuned to prosody, adults paid more attention to prosody. Prosody had an impact on both overall sarcasm score and nice/mean ratings. For both, dripping prosody (i.e., a more exaggerated intonation) was most impactful on sarcastic judgments. This aligns with past research that suggests sarcasm comprehension is greater when dripping intonation, rather than dry intonation, is used (Glenwright et al., 2014). Additionally, prosody played a role in significant interactions for all three measures of sarcasm. For the overall sarcasm score, prosody was most impactful when statements were compliments. For nice/mean ratings, when statements were compliments, dripping prosody was impactful. For funny/serious ratings, critical statements significantly affected both dry and dripping prosody, but the difference due to statements was greater when prosody was dripping. This means that adults were able to recognize non-literal statements (e.g., a complimentary statement about a negative event) and use dripping prosody in order to judge the situation as more sarcastic. This aligns with the research presented earlier on mismatched verbal and non-verbal cues in adults. Adults are able to recognize the disparity between cues and interpret the situation as more sarcastic (Jacob, et al., 2016). It also further confirms that dripping intonation is notable for making sarcastic judgments (Glenwright et al., 2014).

Surprisingly, facial expressions did not predict overall sarcasm scores. I had hypothesized that grimacing faces, especially paired with a compliment, would be a useful cue when judging a statement as sarcastic, but it appears that adult participants did not attune to facial cues. This may be because the context of the story/statement and prosody were sufficient enough cues, meaning that adults did not need to use facial cues

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to predict sarcasm. This supports the claim that adults are capable of using multiple cues or even just one cue to detect sarcasm (Capelli et al., 1990). With that being said, grimacing facial cues did impact both nice/mean and funny/serious ratings (i.e., led to more mean and serious ratings). Though it makes sense that grimacing faces (i.e., a frown) would lead to more mean and serious ratings because the scale used to rate the statements contained facial expressions. Additionally, we know adults attune to facial expressions for making different types of emotional judgments (Agostino, et al., 2017; Ekman et al., 1990; Ekman & Friesen, 1977).

### **Conclusions**

It appears that children attune more to facial expressions than adults, and adults attune more to prosody. Specifically, children are able to recognize the disparity with mismatched cues (e.g., critical statements paired with a smiling face). This is in part similar to the way that adults detect sarcasm (i.e., using mismatched cues as indicators of sarcasm). Though adults primarily use dripping intonation to make sarcastic judgments. This research suggests that over the lifespan, sarcasm comprehension, in regards to cue usage, changes over time from using facial expressions to using prosody.

### **Study Limitations**

The first study limitation would be the number of participants, especially when it came to child participants. I only had 13 child participants versus 40 adult participants. However, even with these small sample sizes, I was able to reveal several important differences in children compared to adults' cue use. Additionally, it is possible that the format of the sarcasm task (isolated stories played on a computer in a lab setting) could have affected the results. Sarcasm is a form of ironic speech that relies on social

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understanding; thus, sarcasm is relevant in social settings. Because our sarcasm measures were not in a true social setting, it might have been more difficult for participants to respond accordingly.

### **Future Research**

Future research should explore when and why individuals switch between these different cues and how else this may differ across the lifespan. Our results show that children focus more on facial cues whereas adults focus more on prosody cues, so it would be interesting to pinpoint the age when the most used cue transitions from facial to verbal. Additionally, it would be interesting to remove the prosody cue in the adult study in order to see if facial cues become significant. Lastly, future research should focus on the link between sarcasm and related cognitive abilities, such as executive function and theory of mind.

### **Study Implications**

As stated, sarcasm is important to understand because of the social implications of not understanding sarcasm (i.e., not knowing someone is teasing you). It is a widely used form of communication, so many people will or have encountered sarcasm on a regular basis. Due to sarcasm's link to higher order thinking (i.e., representing another person's mind) and cognitive abilities, some individuals may struggle in these specific social situations (e.g., an individual with autism). Therefore, if researchers can definitively figure out when and how sarcasm is used, it could be used to educate individuals who struggle in social situations. Research such as this could potentially allow such individuals to better understand and relate to their peers, as well as to feel more comfortable in social contexts.

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Table 1

*Composition of the stories for the sarcasm task.*

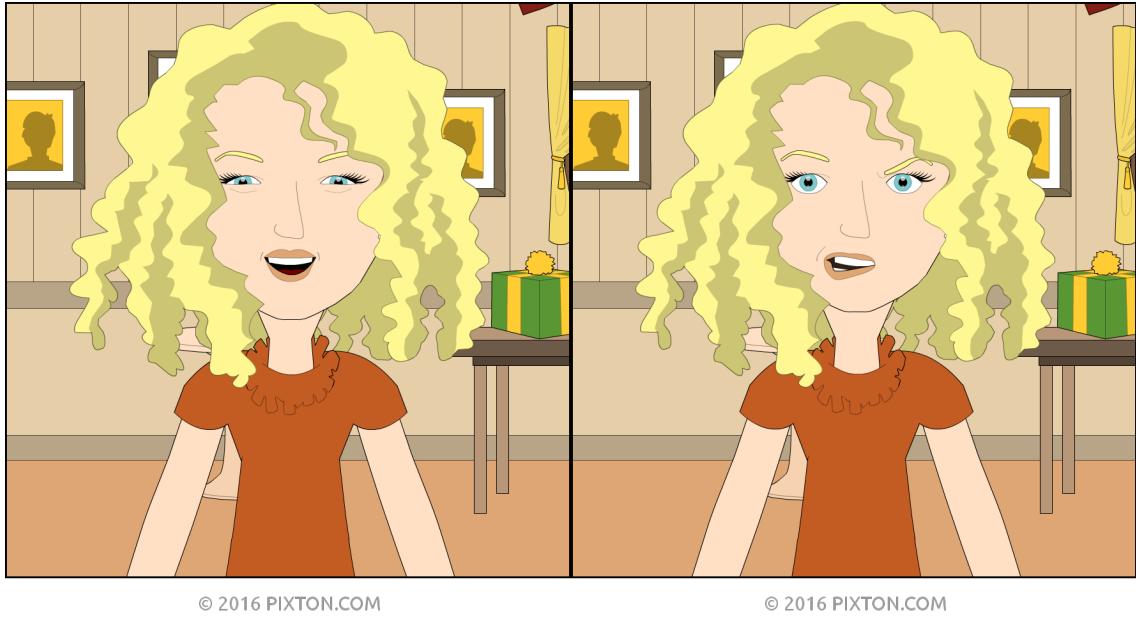
<b>Story Context</b>	<b>Closing Statement</b>	<b>Prosody</b>	<b>Facial Expression</b>	<b>Number of Stories</b>
Positive	Compliment	Dry	Smile	2
Negative	Criticism	Dry	Smile	1
Negative	Criticism	Dry	Grimace	1
Negative	Criticism	Dripping	Smile	1
Negative	Criticism	Dripping	Grimace	1
Negative	Compliment	Dry	Smile	3
Negative	Compliment	Dry	Grimace	3
Negative	Compliment	Dripping	Smile	3
Negative	Compliment	Dripping	Grimace	3

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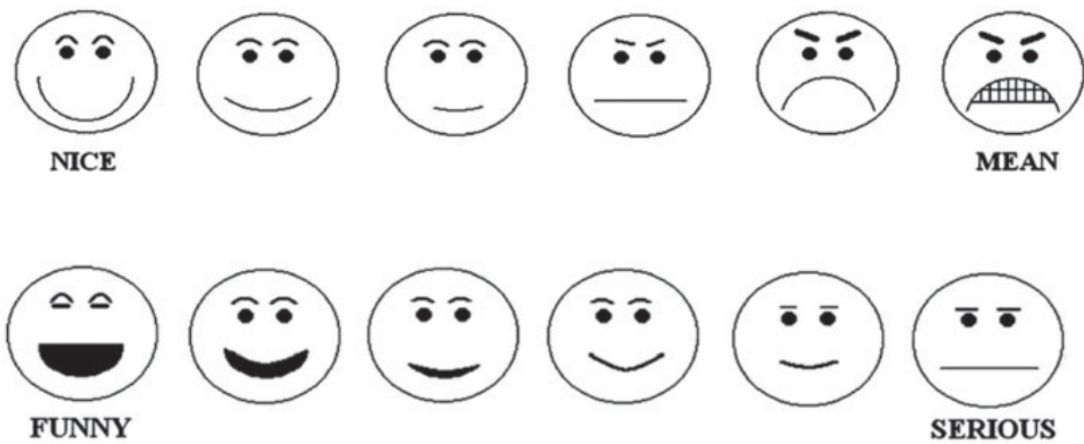
*Figure 1.* Birthday Story. This figure is an example of the stories used for the sarcasm task.





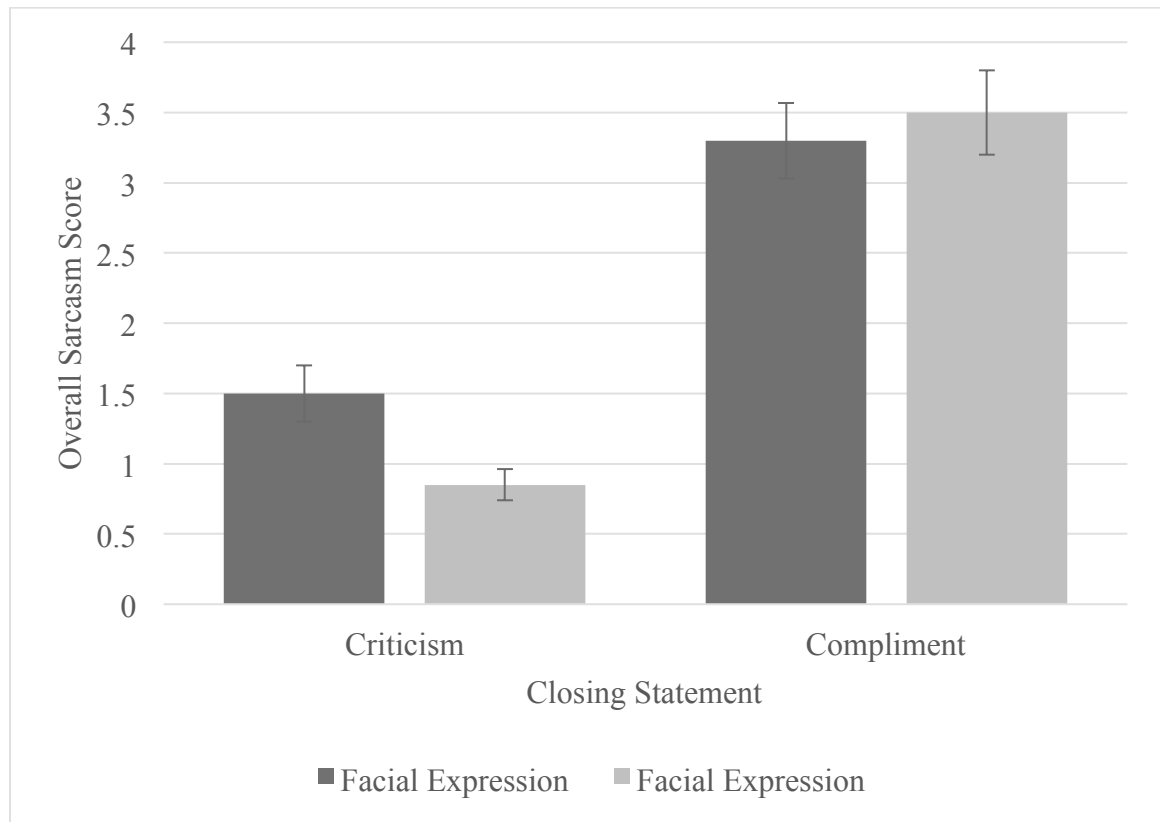
*Figure 2.* Facial Cues. This figure depicts examples of positive faces (i.e., the smiling face on the left) and negative faces (i.e., the grimacing face on the right).

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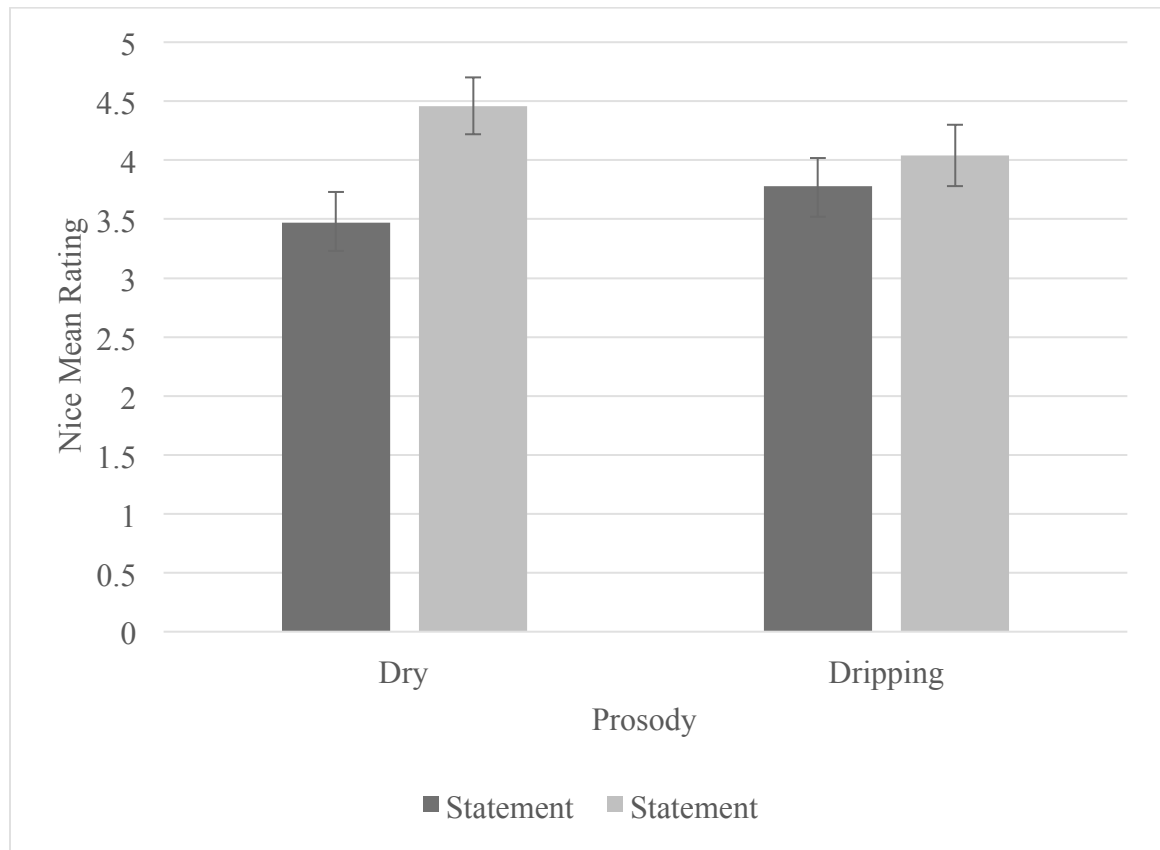
*Figure 3.* Nice/Mean Rating. This figure was used for participants to rate the comment from nice to mean and from funny to serious.

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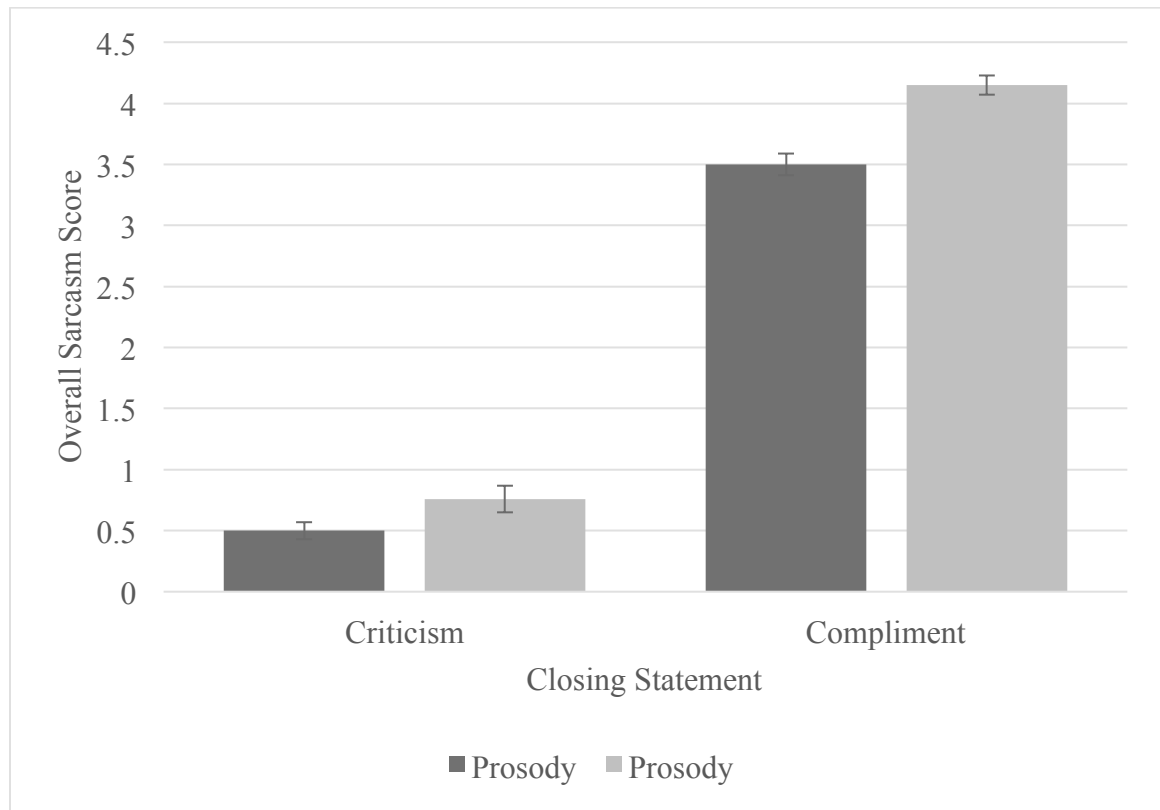
*Figure 4.* Closing Statement by Facial Expression Interaction for Overall Sarcasm Score in Children.

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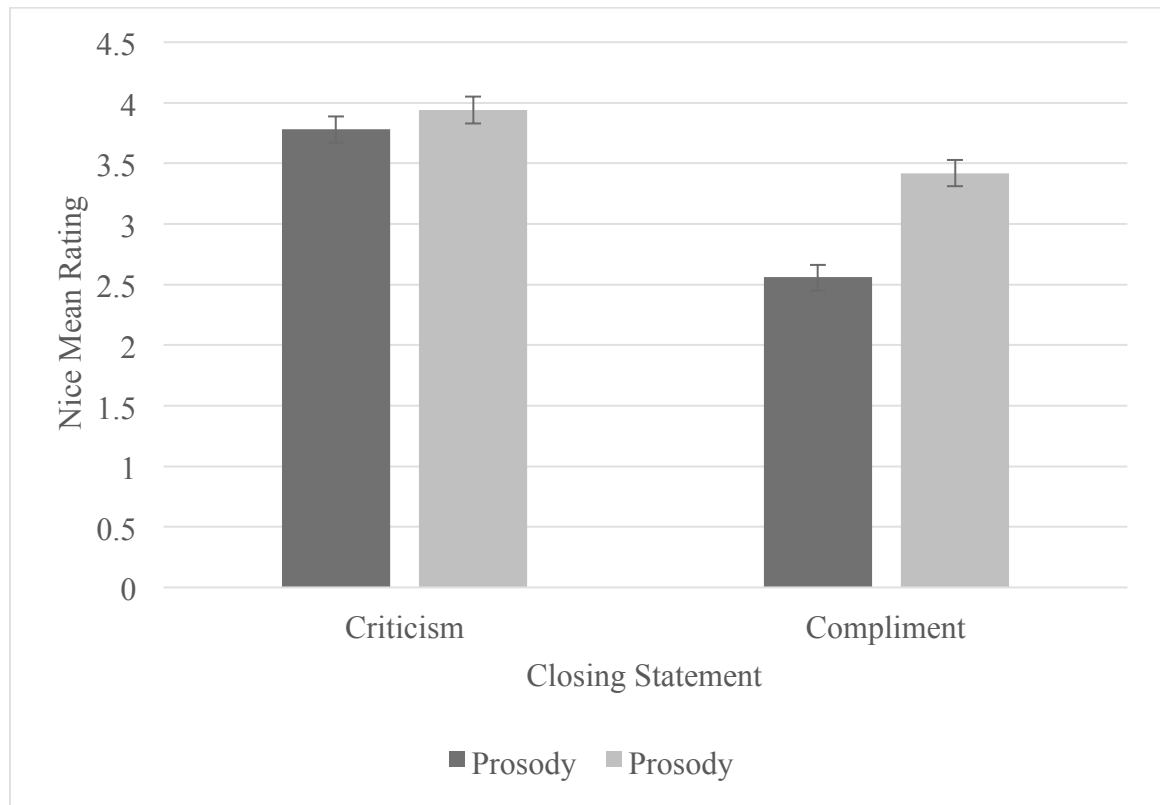
*Figure 5.* Prosody by Closing Statement Interaction for Nice Mean Rating in Children.

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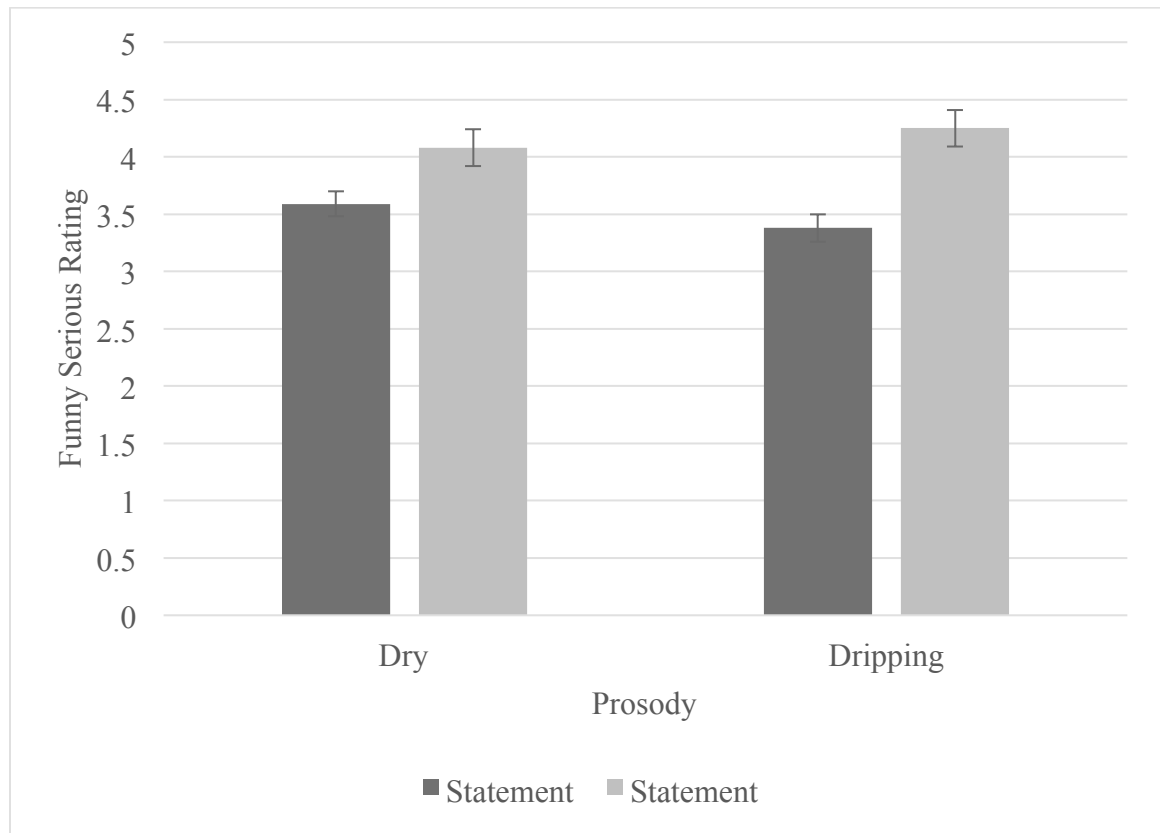
*Figure 6.* Closing Statement by Prosody Interaction for Overall Sarcasm Score in Adults.

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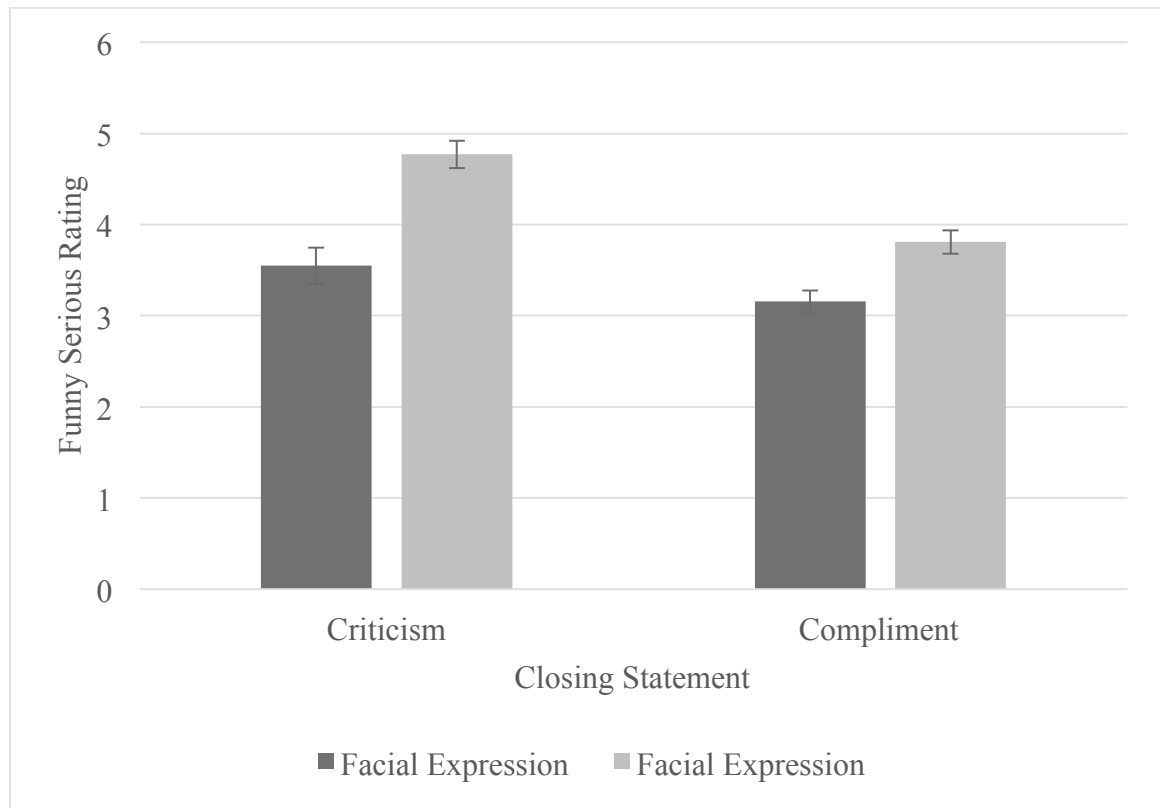
*Figure 7.* Closing Statement by Prosody Interaction for Nice Mean Rating in Adults.

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*Figure 8.* Prosody by Closing Statement Interaction for Funny Serious Rating in Adults.

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*Figure 9.* Closing Statement by Facial Expression Interaction for Funny Serious Rating in Adults.